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--38. (new) A process according to claim 32, wherein the degree of progression of said burning is evaluated by measuring the free magnesia content by dry weight of the mixture.--

REMARKS

New claims 21-38 are submitted herewith, and are believed to overcome all of the formal objections expressed by the Examiner in the outstanding Official Action.

It may be convenient to note that new claims 22-38 correspond approximately to original claims 4-20, respectively.

There is also attached to this amendment a verified translation of our French priority document, by which the two later KUNBARGI patents are removed as references, leaving as a reference the earliest KUNBARGI patent 4,957,556 (the certified copy contains two versions of pages 12-14, comprising the French claims before correction and the French claims after correction.

As the latter are the only claims originally presented in the United States, the former are omitted from the translation.)

Reconsideration is accordingly respectfully requested, for the rejection of the claims as anticipated by or unpatentable over KUNBARGI 4,957,556, MATSUMOTO et al. 4,990,475, or YAMAMURA et al. 5,316,571.

MATSUMOTO et al. disclose different alumina-spinel monolithic refractories, each of them comprising a spinal clinker.

The mole ratio of MgO to Al_2O_3 in the alumina-spinel clinker may be within the range of 0.7:1.3 to 1.3:0.7 (claims 5 to 8; specification column 2, lines 26 to 33).

Nothing is said in this patent concerning the presence of a magnesia spinel mineralogical phase in the alumina-spinel clinker.

Furthermore, Table 1 (column 4 to 6 of this patent) shows the chemical compositions of the refractory materials used in the preparation of the monolithic refractories of the examples. According to these chemical compositions, the monolithic refractories comprise a sintered spinel which is deprived of CaO .

Finally, this patent discloses the production of a granulate, which is obtained by clinkerization, for making a refractory concrete. But this patent does not disclose the production of a clinker hydraulic binder.

KUNBARGI '556 discloses a method for forming very early setting, ultra high strength cements and the cements so produced.

These cements comprise a significant amount of calcium alumino sulfate (C_4A_3S) which is not thermodynamically stable at temperatures above $1,200^{\circ}C$ and decomposes at such elevated temperatures (column 4, line 65 to column 6, line 1).

In the present invention, the clinker-type hydraulic binder is used for producing a refractory concrete, which is used for manufacturing a steel ladle.

However, since a ladle is a chemical reactor in which internal temperatures can reach 1700°C (page 1, lines 10 to 12 of the present application), the cements of KUNBARGI are not suited for the temperature conditions of the steel ladles.

Furthermore, we note that, according to the specification of KUNBARGI (from column 5, line 61 to column 6, line 2), the raw material used for the fabrication of the cement may comprise small amounts of impurities including magnesium oxide MgO (see also examples 1 and 2) in which the clay comprises 0.26% by weight of MgO, and the limestone and the gypsum both comprise 0.60% by weight of MgO.

Thus, it is likely that the presence of MgO in the raw material can lead to the formation of magnesium spinel. However, the amount of magnesium spinel would necessarily be low, and in any case, lower than 68% of the binder by dry weight.

YAMAMURA et al. disclose alumina-spinel monolithic refractories containing one or more alumina-spinel clinker(s).

In a first embodiment (specification column 2, lines 49 to 55; claim 1), the monolithic refractory contains:

- from 80 to 92% by weight of a first clinker of alumina-spinel type having a $\text{MgO}:\text{Al}_2\text{O}_3$ molar ratio within 0.14:1.86 to 0.6:1.4, and

- from 8 to 20% by weight of an alumina cement.

In a second embodiment, the monolithic refractory (specification column 2, lines 56 to 61; claim 2) contains:

- from 5 to 92% by weight of the first clinker,
- not more than 87% by weight of an alumina material,

and

- from 8 to 20% by weight of an alumina cement.

In a third embodiment (specification column 2, line 64 to column 3, line 5; claim 3) the monolithic refractory contains:

A. 100 parts by weight of a mixture comprising:

- from 5 to 92% by weight of the first alumina-spinel clinker,

- from 8 to 20% by weight of alumina cement, and

- not more than 87% by weight of alumina material, and

B. from 10 to 40 parts by weight of alumina crushed grain having a grain size of from 10 to 50 nm.

In a fourth embodiment (specification column 3, lines 29 to 37; claim 4); the monolithic refractory contains:

- from 30 to 82% by weight of the first clinker,

- from 8 to 20% by weight of an alumina cement, and

- from 10 to 40% of a second clinker of alumina-spinel type having a $\text{MgO}:\text{Al}_2\text{O}_3$ molar ratio within 0.9:1.1 to 1.3:0.7.

Finally, in a fifth embodiment (specification column 3, lines 38 to 48; claim 5), the monolithic refractory contains:

- from 30 to 82% by weight of the first alumina-spinel clinker,
 - from 8 to 20% by weight of alumina cement,
 - not more than 45% by weight of an alumina material,
- and
- from 10 to 40% by weight of the second alumina spinel clinker.

Whatever the alumina-spinel type clinker (the first with a molar ratio ranging from 0.14:1.86 to 0.6:1,4 or the second with a molar ratio ranging from 0.9:1.1 to 1.3:0.7), nothing is explicitly said in YAMAMURA et al. concerning the presence of a calcium aluminate mineralogical phase in the clinker.

Nevertheless, the chemical composition of the alumina spinel type A and B described in Table 1 of the Example 1 comprises 0.3% by weight of CaO. Thus, it is very likely that the presence of CaO in an alumina-spinel clinker could lead to the formation of an aluminate mineralogical phase with a lime content of less than 15% of the binder by dry weight.

However, the alumina-spinel clinkers of YAMAMURA et al. do not comprise calcium aluminate mineralogical phases which are essentially made of Ca and Ca₂ (with C being CaO and A being Al₂O₃).

The main difference between YAMAMURA et al. and new claim 21 lies in the fact that the magnesium spinel of new claim

21 comprises one or more calcium aluminate mineralogical phases which are essentially made of Ca and Ca_2 (with C being CaO and A being Al_2O_3). Such a binder composition, with a pattern Ma-Ca- Ca_2 (with M=MgO) prevents the formation of C_{12}A_4 , which is a phase adapted to lead to a stiffening cement (specification page 4, lines 6 to 9 of the present application).

However, nothing is said in YAMAMURA et al. (as well as in the other documents of the prior art) concerning such a problem (i.e., the presence of C_{12}A_7), and even less concerning a solution consisting in formulating a binder composition in which the calcium aluminates are essentially made of Ca and Ca_2 (C=CaO and A= Al_2O_3).

As the new claims clearly bring out these distinctions with ample particularity, it is believed that they are all patentable, and reconsideration and allowance are respectfully requested.

Respectfully submitted,

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June 19, 2003